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European Patent Office

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(11) EP 0 729 153 A2

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
28.08.1996 Bulletin 1996/35

(51) Int. Cl.⁶: G11B 27/32, G11B 20/12,
G11B 21/08, G11B 27/10,
G11B 7/00, H04N 5/85,
H04N 5/926

(21) Application number: 96101933.8

(22) Date of filing: 09.02.1996

(84) Designated Contracting States:
DE FR GB

- Nakamura, Masafumi
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(30) Priority: 24.02.1995 JP 36461/95

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(54) Optical disk and optical disk reproduction apparatus

(57) An optical disk recording thereon compressed moving picture data and an optical disk reproduction apparatus each capable of easily effecting trick play such as high speed reproduction and a retrieval operation at a high speed. Additional information necessary for trick play is recorded in an arbitrary area of an optical disk such as a TOC (Table of Contents) or a leading

sector (sector 0) of the disk, and a sector address is added to each sector. To conduct trick play, an I picture, a P picture and a B picture contained in a GOP layer inside a bit stream of compressed image data are extracted and reproduced in accordance with a reproduction speed by looking up a trick play table.

FIG. 1

INDEX NO.	SECTOR ADDRESS
1	0 0 0 0
2	0 0 0 1 F
3	0 0 0 2 7
4	0 0 0 4 B
.	.
.	.
.	.

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sector (sector 0) of the disk, and a sector address is added to each sector. To conduct trick play, an I picture, a P picture and a B picture contained in a GOP layer inside a bit stream of compressed image data are extracted and reproduced in accordance with a reproduction speed by looking up a trick play table.

FIG. 1

INDEX NO.	SECTOR ADDRESS
1	0 0 0 0 0
2	0 0 0 1 F
3	0 0 0 2 7
4	0 0 0 4 B
.	.
.	.
.	.

Figs. 6A and 6B are diagrams each showing a sixth embodiment of the optical disk according to the present invention;

Fig. 7 is a schematic view showing a data format of the optical disk according to the seventh embodiment of the present invention;

Fig. 8 is a schematic view showing the data format of the optical disk according to the eighth embodiment of the present invention;

Fig. 9 is a schematic view showing the data format of the optical disk according to the ninth embodiment of the present invention;

Fig. 10 is a schematic view of tracks on an optical disk according to the present invention; and

Fig. 11 is a flowchart of an operation at the time of trick play.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Hereinafter, some preferred embodiments of the present invention will be explained with reference to the accompanying drawings. First, the embodiment shown in Fig. 1 will be explained.

Fig. 1 shows an optical disk according to the first embodiment of the present invention. The diagram shows a table for trick play on the optical disk. This trick play table records the numbers of pieces of music and movements (indices) and corresponding sector addresses for all the pieces and movements recorded on the optical disk, for example. Sector addresses are added to each sector of the optical disk, and this trick play table is recorded in an area such as a TOC (Table of Contents) or a leading sector (sector 0) of the disk.

When this optical disk is loaded to an optical disk reproduction apparatus, a system microcomputer first reads the trick play table and stores it in a work area. When trick play is effected, the address of the sector to be read out is determined by looking up this trick play table and is then retrieved on the optical disk so as to reproduce an image.

Because the address of the sector to be read out is determined by looking up the trick play table, retrieval can be carried out at a high speed.

Fig. 2 shows the optical disk according to the second embodiment of the present invention. The drawing shows the trick play table on the optical disk. The trick play table records all the sector addresses of the data recorded on the optical disk and the corresponding time codes. This trick play table is recorded in an area such as the TOC (Table of Contents) or the leading sector (sector 0) of the disk.

When this optical disk is loaded to the optical disk reproduction apparatus, the system microcomputer first reads the trick play table and stores it in the work area. When trick play is effected, the address of the sector to be read out is determined by looking up this trick play table, and the address is retrieved on the optical disk so as to reproduce the image.

Because the address of the sector to be read out is determined by looking up the trick play table during trick play other than normal reproduction, trick play can be easily conducted, and retrieval can be made at a high speed.

When compressed image data of a variable transfer rate is reproduced, the sector address cannot be determined from the time code because the sector address and the time code do not have a proportional relationship, and correct retrieval cannot be made. However, the corresponding sector address can be obtained by looking up the trick play table of this embodiment, and retrieval can be correctly made.

Fig. 3 shows the optical disk according to the third embodiment of the present invention. The drawing shows the trick play table on the optical disk. The trick play table records all the sector addresses of the data recorded on the optical disk and their contents. This trick play table is recorded in an area such as the TOC (Table of Contents) or the leading sector (sector 0) of the disk.

When the optical disk is loaded to the optical disk reproduction apparatus, the system microcomputer first reads the trick play table and stores it into the work area.

When retrieval is effected, the address of the sector to be read out is determined by looking up the trick play table, and this address is retrieved on the optical disk so as to reproduce the image.

Because the address of the sector to be read out is determined by looking up the trick play table during trick play other than normal reproduction, trick play can be easily conducted and retrieval can be made at a high speed.

Fig. 4 shows the optical disk according to the fourth embodiment of the present invention. The drawing shows the trick play table on the optical disk. The trick play table records an SH (Sequence Header) added to the leading part of a GOP recorded on the optical disk and its sector address. This trick play table is recorded in an area such as the TOC (Table of Contents) or the leading sector (sector 0) of the disk.

When the optical disk is loaded to the optical disk reproduction apparatus, the system microcomputer first reads the trick play table and stores it in the work area. When retrieval is conducted, the address of the sector to be read out is determined by looking up the trick play table, and the address is retrieved on the optical disk so as to reproduce the image.

Because the address of the sector to be read out is determined by looking up the trick play table during trick play other than normal reproduction, trick play can be easily conducted and retrieval can be made at a high speed.

Fig. 5 shows the optical disk according to the fifth embodiment of the present invention. The drawing shows the trick play table on the optical disk. The trick play table records the sector addresses of the start and the end of an I picture recorded on the optical disk. This trick play table is recorded in an area such as the TOC

the B picture is further retrieved and reproduced skipingly in addition to the I picture and the P picture at this time, various speed reproduction can be smoothly made. Thereafter, the operation described above is repeated if the n-time speed reproduction continues.

Though the explanation given above deals with the n-time speed reproduction operation, the present invention can be easily applied to reproduction in the reverse direction when n in the n-time speed reproduction is negative (-). Further, slow reproduction can be made when $|n| < 1$.

As described above, when retrieval is made by looking up the trick play table, image reproduction of the GOP unit can be easily made in the image data encoded by the MPEG system, for example. Therefore, besides the normal speed continuous reproduction operation, operations trick play such as slow reproduction, high speed reproduction, reproduction in the reverse direction, and the high speed retrieval operation become possible.

The present invention is not particularly limited to the foregoing embodiments but can be changed or modified in various ways without departing from the scope thereof.

In the optical disk according to the present invention, information necessary for trick play is recorded in an arbitrary area such as the TOC (Table of Contents) or the leading sector (sector 0) of the disk, and the sector address is added to each sector. The optical disk reproduction apparatus looks up the trick play table, and extracts and reproduces the I picture, P picture and B picture contained in the GOP layer inside the bit stream of the compressed image data. Accordingly, the present invention can easily execute trick play such as slow reproduction, high speed reproduction, reproduction in the reverse direction and the retrieval operation. It is obvious in the explanation given above that the image data may be the moving picture or the still picture. It is further obvious that the present invention can be similarly applied to the audio data or control data carried by the image data.

Claims

1. An optical disk recording thereon a main information divided by a predetermined unit and identification information in said division unit, characterized in that said main information contains at least a compressed image data, additional information necessary for selectively reproducing said image data is recorded in a specific area of said optical disk before said main information is reproduced, and said image data can be selectively reproduced on the basis of said identification information by reading said additional information.
2. An optical disk according to claim 1, wherein said predetermined unit is a sector on a recording for-

mat of said optical disk, and said identification information is the address of said sector.

3. An optical disk according to claim 1, wherein said additional information is the one that represents correspondence between the sector address on a recording format of said optical disk and a chapter of said image data.
4. An optical disk according to claim 1, wherein said additional information is the one that represents correspondence between the sector address on a recording format of said optical disk and time information of said image data.
5. An optical disk according to claim 1, wherein said additional information is the one that represents correspondence between the sector address on a recording format of said optical disk and information representing the contents of said main information.
6. An optical disk according to claim 1, wherein said additional information is the one that represents a table of sector addresses of a specific kind of image information.
7. An optical disk according to claim 1, wherein said additional information is the one that represents correspondence between a sequence header added to the leading part of a GOP (Group of Picture) stipulated by the MPEG standard and the sector addresses.
8. An optical disk according to claim 1, wherein said additional information is the one that represents correspondence between an I picture stipulated by the MPEG standard and the sector address of the start or end of said I picture.
9. An optical disk according to claim 1, which further includes a plurality of said additional information, and an identification code is added to each of said additional information so that said additional information can be identified.
10. An optical disk according to claim 2, wherein said sector is further divided into blocks, a sync signal is annexed to the leading part of each of said blocks and the address of said sector is recorded, and the address of said sector is the same for each block inside said block.
11. An optical disk according to claim 2, wherein said sector is further divided into blocks, a plurality of kinds of sync signals are annexed to the leading part of each of said blocks and the address of said sector is recorded, and the address of said sector is completed in a plurality of blocks inside said sector.

FIG. 1

INDEX NO.	SECTOR ADDRESS
1	00000
2	0001F
3	00027
4	0004B
.	.
.	.

FIG. 2

SECTOR ADDRESS	TIME CODE
00000	00:00:00
00001	00:00:01
00002	00:00:02
00003	00:00:03
.	.
.	.

FIG. 5

I PICTURE	SECTOR ADDRESS
I1	00000
I2	0001F
I3	00027
I4	0004B
.	.
.	.
.	.

FIG. 6A

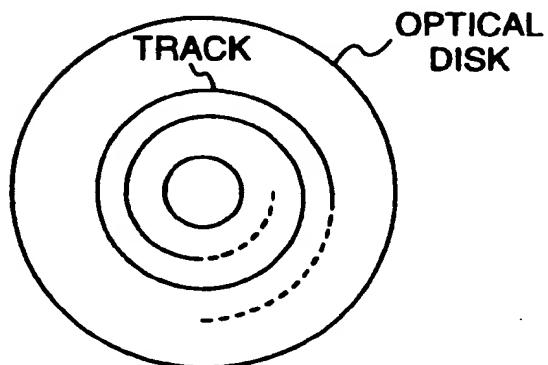


FIG. 6B

IDENTIFICATION CODE

T1	TABLE 1	T2	TABLE 2	T3	TABLE 3	
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FIG. 9

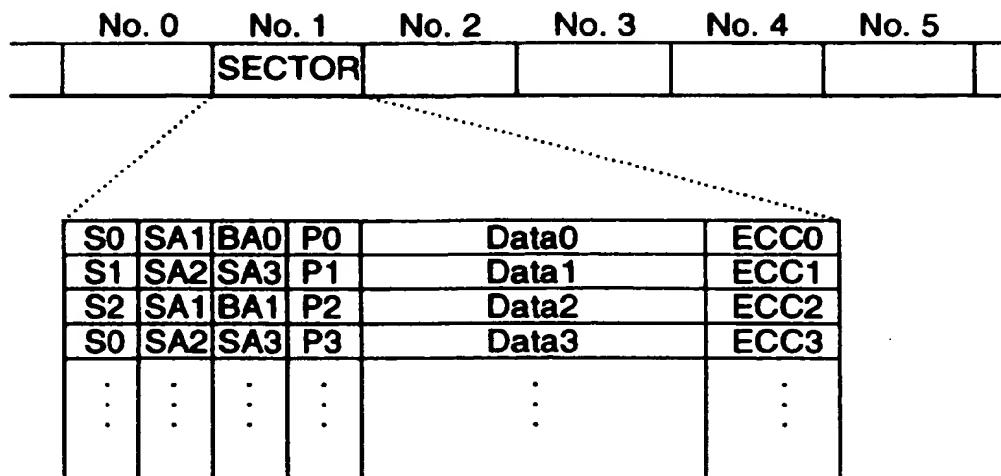
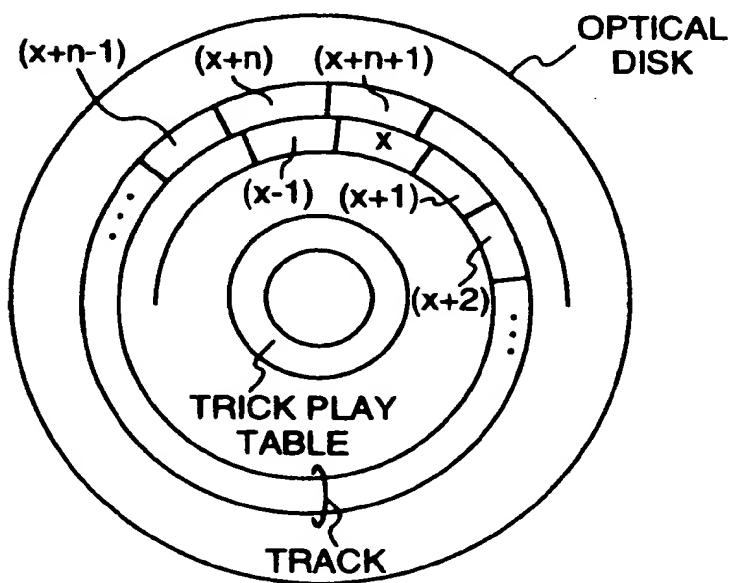
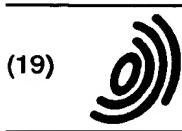


FIG. 10





(19)

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(11)

EP 0 729 153 A3

(12)

EUROPEAN PATENT APPLICATION

(88) Date of publication A3:
04.12.1996 Bulletin 1996/49

(51) Int. Cl.⁶: G11B 27/32, G11B 20/12,
G11B 21/08, G11B 27/10,
G11B 27/30, G11B 19/02,
G11B 7/00, H04N 5/85,
H04N 5/926, H04N 9/804

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FIG. 1

INDEX NO.	SECTOR ADDRESS
1	0 0 0 0
2	0 0 0 1 F
3	0 0 0 2 7
4	0 0 0 4 B
•	•
•	•
•	•



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 96 10 1933

DOCUMENTS CONSIDERED TO BE RELEVANT									
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)						
A	PATENT ABSTRACTS OF JAPAN vol. 18, no. 687 (E-1651), 26 December 1994 & JP-A-06 276485 (VICTOR CO. OF JAPAN, LTD.), 30 September 1994, * abstract *	1,6,8, 12-15							
A	PATENT ABSTRACTS OF JAPAN vol. 18, no. 681 (E-1649), 21 December 1994 & JP-A-06 268969 (VICTOR CO. OF JAPAN, LTD.), 22 September 1994, * abstract *	1,2,4,8, 12-15							
A	US-A-4 361 849 (BOLGER) * the whole document *	1,12,14, 15							
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)						
<p>The present search report has been drawn up for all claims</p> <table border="1"> <tr> <td>Place of search</td> <td>Date of completion of the search</td> <td>Examiner</td> </tr> <tr> <td>THE HAGUE</td> <td>24 September 1996</td> <td>Daalmans, F</td> </tr> </table>				Place of search	Date of completion of the search	Examiner	THE HAGUE	24 September 1996	Daalmans, F
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